Special Temporary Authorization
File No.: 0059-EX-ST-2022

Exhibit 1: Need for the STA, Explanation of Experimentation, and Antenna Information

Generation Orbit
Atlanta, GA
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Exhibit 1: Need for the STA, Confidentiality, Explanation of Experimentation, and Antenna Pointing Information

Applicant Background: Generation Orbit (GO) is a leader in hypersonic flight research. GO is developing a hypersonic test platform for the Department of Defense (DoD) and other government agencies. The company provides low-cost liquid rocket powered hypersonic testing capability for experiments in hypersonic flight technology.

Need for STA: STA is necessary to provide authority to operate a high data rate telemetry system designed for future hypersonic flight testing on an experimental re-entry system flight test as part of the first phase of a test program. Radio telemetry is a critical function for the hypersonic test platform to capture data from the experiments. The experiment will validate the link budget model and verify the functionality of the transmitter and receiver for future hypersonic flight experiments. The telemetry will be transmitted in frequency bands allocated to mobile aviation telemetry equipment per 47 CFR I.A.2.B § 2.106 Table of Frequency Allocations. The operations will be carried out at a location that is not on a government test range, so typical experimental operation and authorization via other means (e.g., 7.11 authority) is not available.

Description of the Experiment: The experimental operation requested in the STA application is for the evaluation of a radio telemetry system over speed and link distance. The experiment tests the system in benign dynamics over increasing link distance while the re-entry system ascends and then in high dynamics during the re-entry system's free-fall descent. The telemetry transmitter will be installed on the re-entry system and the receiver will be installed in a stationary ground shelter. The re-entry system will fly from ground level, approx. 2,430 ft MSL, to a maximum altitude between 100,000 ft and 110,00 ft MSL during the experiment. The re-entry system will disengage from the balloon and descend in free fall to 25,000 ft. The re-entry system will deploy a parachute and guided parafoil system and steer itself to a designated landing site. The telemetry radio will transmit data throughout the re-entry system's flight.

Operation of the RF equipment is addressed in the STA application, File No. 0059-EX-ST-2022.
Other aspects of the tests requiring certification (e.g. flight safety) are being addressed through the appropriate authorities (FAA).

Test Schedule The test will begin no earlier than March 1, 2022 and will conclude no later than August 25, 2022.
The test will last for 1 to 4 hours. Detailed test plans and schedules will be available no later than March 1, 2022.

Spectral Usage The RF link utilizes single channel S-band downlink, with the radio transmitting in the 2360-2395 MHz frequency range. The RF transmissions will utilize IRIG-106 compliant ARTM Tier I SOQPSK-TG modulation at 28 Mbps.
The transmitter has a maximum OTA data rate of 28 Mbps. All transmitted data will be encoded with 2/3 Low Density Parity Check (LDPC) Forward Error Correction (FEC) prior to transmission. Thus 17.92 Mbps with 2/3 LDPC yields 28 Mbps OTA.
SOQPSK-TG modulation occupies a bandwidth of 0.78 times the data rate, which will be 21.84 MHz for the experiment.
The transmitter tunes within the indicated frequency ranges in 0.5 MHz steps, although the allowable transmit center frequency is limited by the signal bandwidth and the proximity of the occupied bandwidth to the band edges.
Because the objective of the test is to transmit data at the highest rate possible within the allocated frequency band, the center frequency that would be optimal for assignment in the case of the highest bandwidth signal is 2377.5 MHz.

<u>Location of Testing</u>

All testing covered by this STA will be performed in the vicinity of Madras, OR (N 44°40’13”, W 121°09’18”, 2438 ft MSL). The surface terminal will be located on the ground, at the Madras Municipal Airport. The re-entry system will ascend from the airport on a balloon to a maximum altitude between 100,000 ft and 110,000 ft MSL and move laterally with the wind. The prevailing winds in Madras, OR in early spring at WSW to W and in late spring and summer are NW to NNW. Detailed flight profile definition will be available prior to any test flights. All flight patterns are being coordinated with the Madras airport. The maximum range from the re-entry system to the surface terminal is 30 mi. depending on wind conditions. The reception station will be within line of sight from the launch point and maintain line of sight throughout the ascent and free fall descent. At the parachute deployment altitude of 25,000 ft MSL and at this maximum range, the elevation angle measured from the surface terminal to the re-entry system at parachute deployment is approximately 7.8 degrees, assuming 30 mi. downrange, a flat earth geometry, and reception station elevation 2,440 ft MSL. The trajectory of a previous re-entry system test is illustrated in Figure 1. An aeronautical map of the Madras, OR vicinity is shown in Figure 2.

<u>Madras, Oregon, Municipal Airport (S33)</u>
Latitude: North 44 39 53
Longitude: West 121 9 6
Radius of Operation: 30 mi. (27 Nmi 50 km)
Maximum Altitude (TX Antenna Height) MSL: 110,000 ft (33500 m)
Distance to landing area: 18 Nmi (33.5 km)
Elevation of ground (airport) MSL: 2,438 ft (743 m)

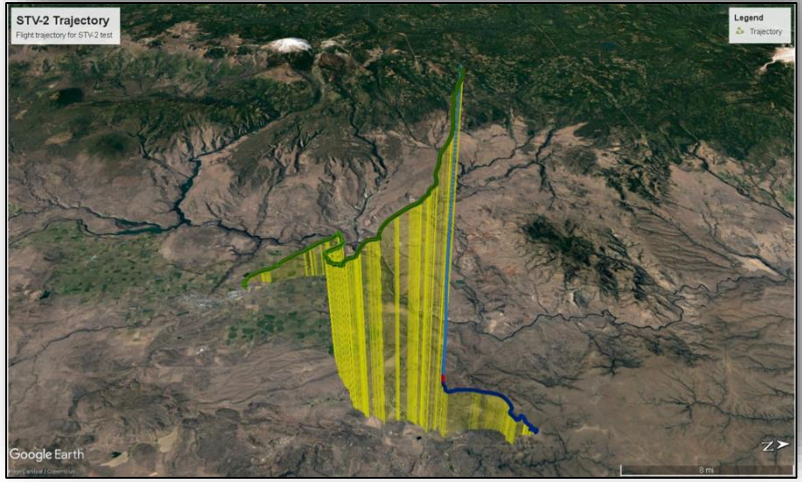

Figure 1: Recent re-entry system flight trajectory

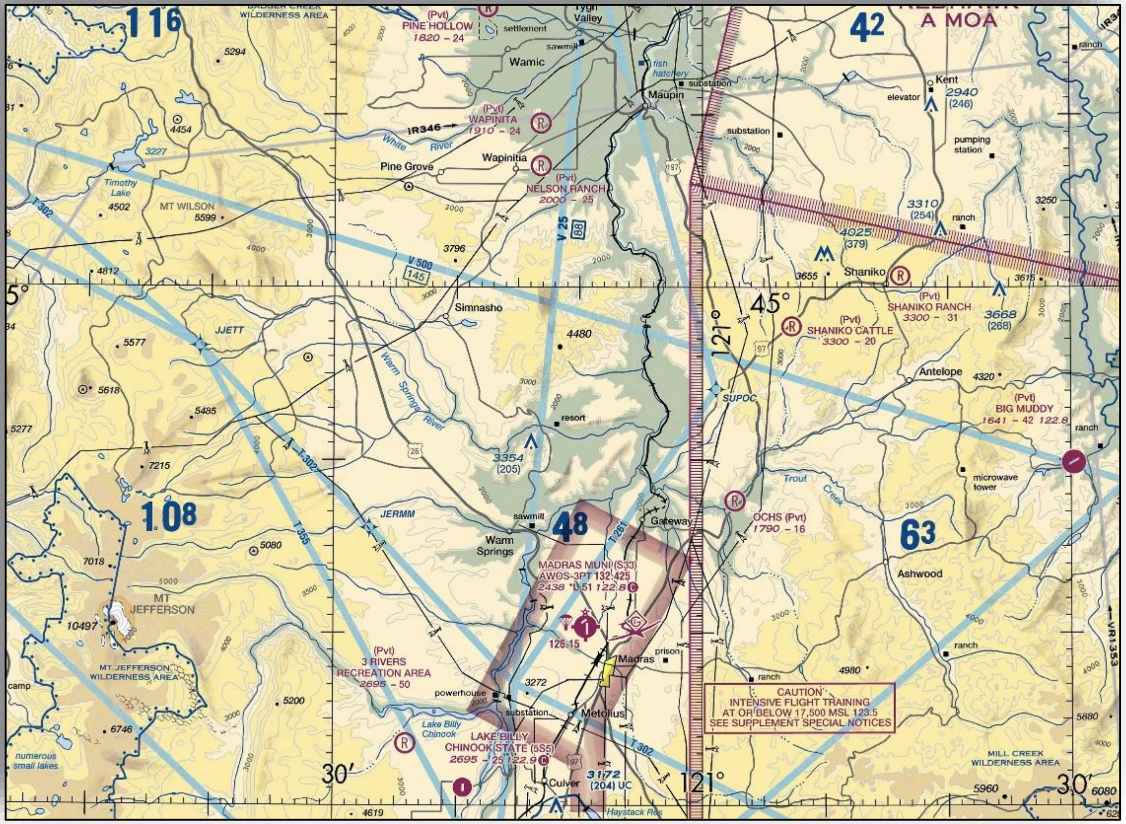

Figure 2: Madras, OR vicinity

<u>Transmitter Antenna System</u> The transmitter antenna system consists of two hemispherical radiators pointing in opposite directions to form a quasi-omnidirectional antenna pattern so that pointing is not necessary. The radiators are fed via a splitter from the transmitter output.
The radiation patterns in H/E cuts (which would correspond to the azimuth and elevation planes depending on the orientation in the experiment) look similar as shown in the picture below. For each radiator, the measured peak gain is 4 dBi, while the -3 dB bandwidth is about 105 deg.
During the experiment, the radiators will be oriented within 15 degrees of horizontal in opposite directions. The azimuth orientation of the re-entry system will not be controlled during the experiment.

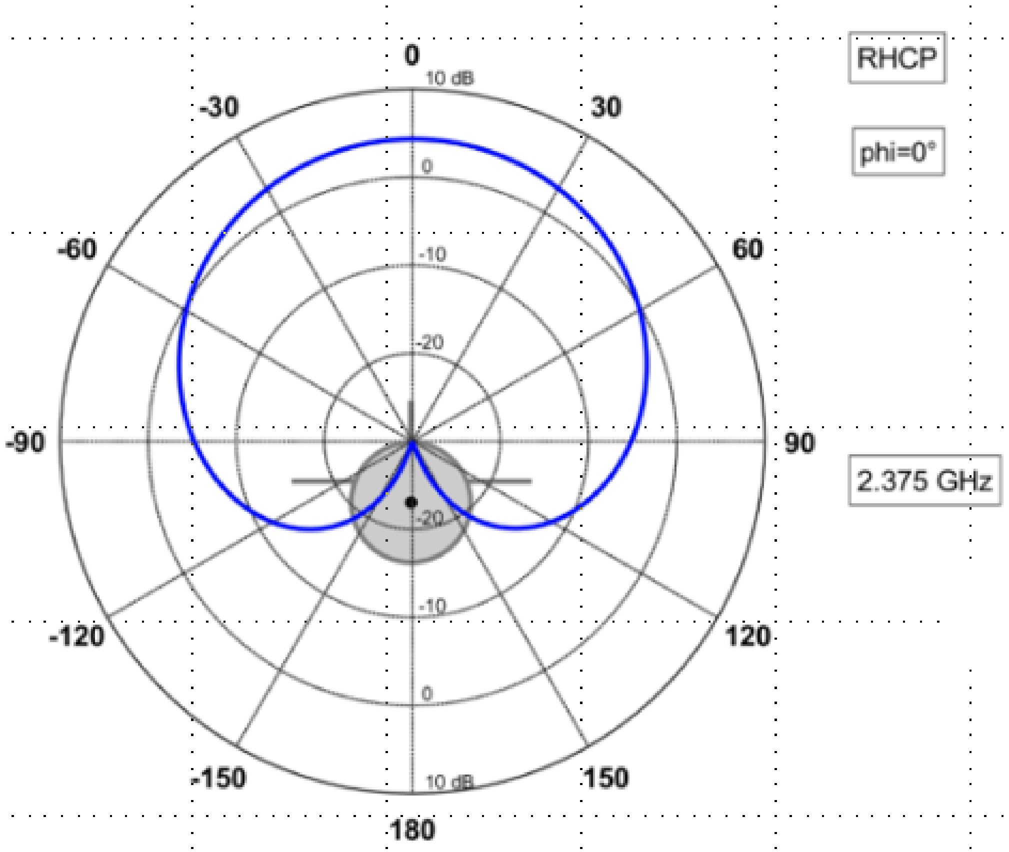

Figure 3: Radiation Pattern from Each Antenna Element (Radiator)

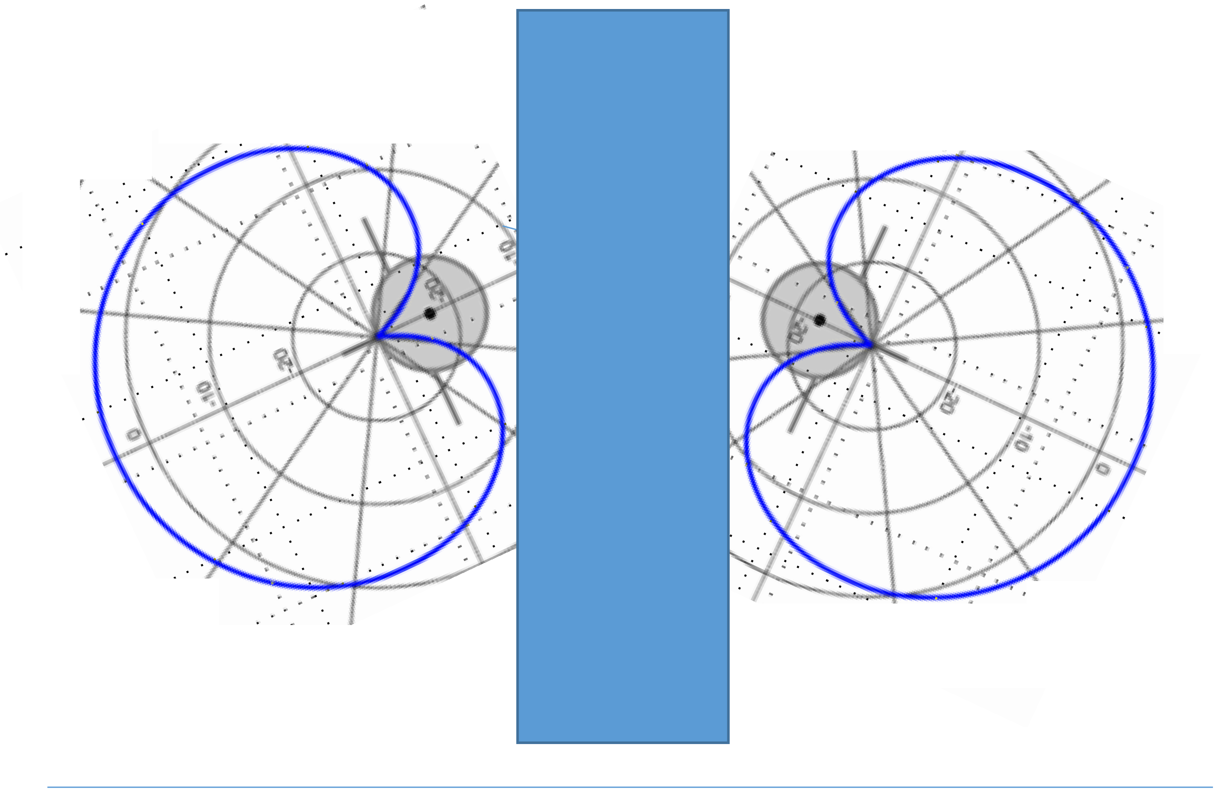
Figure 4: Vertical Profile of Antenna Operation

Telemetry Transmission Data

- Frequency Ranges: 2360-2395 MHz
- Peak Transmit Power Conducted Power to Each Radiator: </= 39 dBm (8 W)
- EIRP: </= 43 dBm (20 W)
- Maximum Data Rate (Info + Encoding): 28 Mbps
- Error Correction: LDPC (2/3)
- Modulation: SOQPSK-TG
- Necessary Bandwidth: 21.84 MHz
- Emission Designators: 21M8GID

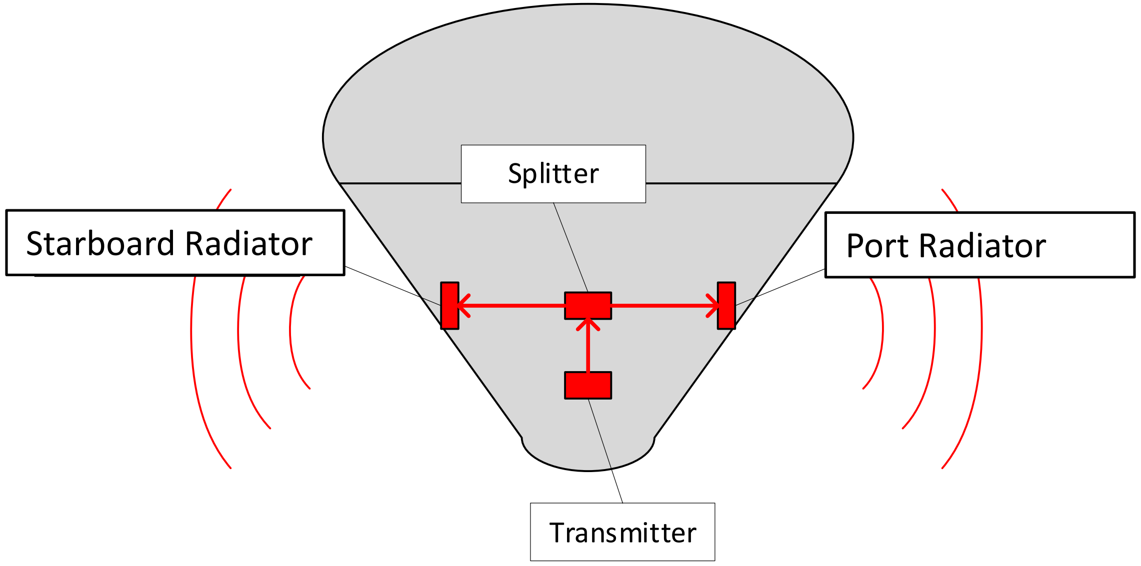

Figure 5: Re-entry system with telemetry experiment

Reception Site Antenna System The reception site will use a JDA VT-006 antenna, (a 9.5 inch parabolic dish), which automatically points toward the re-entry system, in elevation and azimuth, as it flies within line-of-sight of the reception site. Only knowledgeable test personnel will be allowed access to the reception site. The pointing angle is determined automatically by a tracking system in the reception antenna.

Azimuth angle: The surface terminal azimuth pointing angle depends on the re-entry system's location and can theoretically vary to any point on the compass dependent on the wind conditions during the test. The prevailing winds in Madras, OR in early spring at WSW to W and in late spring and summer are NW to NNW.

Elevation angle: Elevation angle will typically vary from near-horizon (after descent and parachute deployment) to +45 or higher (during ascent).

Summary STA is necessary to provide authority to operate high data rate telemetry system designed for future hypersonic flight testing in frequency bands allocated for space research and unmanned aeronautical telemetry as part of the first phase of a test program. Questions regarding this STA application should be referred to Caleb Phillips (caleb.phillips@generationorbit.com) , (404) 991-2208.

Stop Buzzer Contacts: In the even of interference caused by the experiment, the following individuals will be responsible for ensuring that transmissions cease as soon as possible after notification: Primary: Matt Maclaine (321)-279-2057 (cell); Tyler Kunsa (610) 731-3080 (cell); Backup: Casey Johnson (770) 296-8605 (cell); Zack Reinhardt (678) 910-2911

Figure 6: Test Profile

Not to scale